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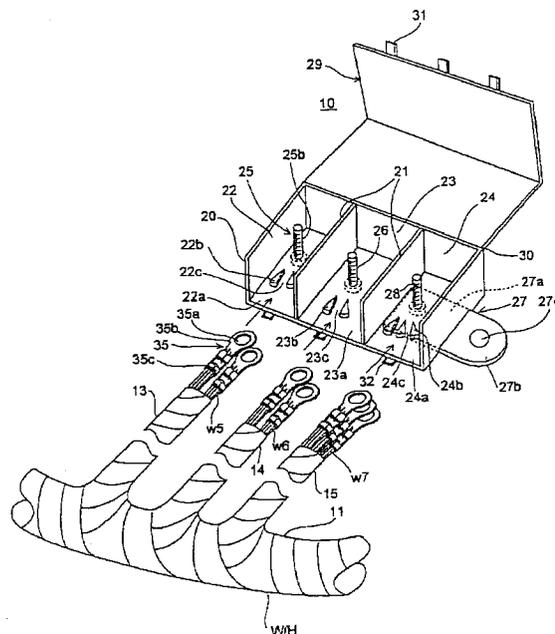
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(54) A joint device for an automotive wiring harness

(57) To form a joint circuit without inserting terminals into a connector at a later stage.

Mount hole provided terminals 35 are connected in advance with ends of wires to be connected with each other among the wires which will form an automotive wiring harness. Partition walls 21 are provided in an insulation casing 20 to define a plurality of terminal connecting chambers 22, 23. The heads of bolts are embedded in the bottom walls of the respective terminal connecting chambers so that the shafts thereof projects. The mount holes of the terminals at the ends of the wires to be connected with each other are fitted down on the bolt shafts and tightened by nuts to form a joint circuit. This joint circuit includes a joint circuit for the grounding.

FIG. 1



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Description

[0001] The present invention relates to a joint device for an automotive wiring harness and is particularly designed to form a joint circuit by connecting wire groups which will form a wiring harness with each other without using a splice connection and a connection by a joint connector so as to make it unnecessary to later insert terminals into a connector when a wiring harness is formed on an assembly board.

[0002] Conventionally, the wire groups of the wiring harness have been connected with each other to form a joint circuit by a splice connection as shown in FIG. 8 or by using a joint connector 1 as shown in FIG. 9.

[0003] In the case of the splice connection shown in FIG. 8, cores exposed from ends of wires w2, w3 are connected with a wire w1 peeled in its intermediate positions by intermediate barrels 2 when a partly bound harness is formed. Terminals at the ends of the wires w2, w3 of the partly bound harness having these splice connection portions are inserted into a connector 3 of another partly bound harness for the connection when a wiring harness is fully bound on an assembly board.

[0004] The connection by the joint connector 1 shown in FIG. 9 is made by inserting terminals 4 connected with wire ends into a joint connector 1 and connecting them by a joint busbar 5 accommodated in the joint connector 1. In the case of using the joint connector 1, all wires cannot be connected with the joint connector when the partly bound harness is formed. Accordingly, the wires of one partly bound harness are connected with the joint connector 1 at this stage, and terminals at ends of wires of an other partly bound harness are later inserted into the joint connector 1 for the connection when the wiring harness is fully bound on the assembly board.

[0005] As described above, in each of the prior art connection by splices shown in FIG. 8 and the prior art connection by the joint connector shown in FIG. 9, there are terminals which are not inserted into the connector, i.e. the terminals are not completely inserted into the connector when the partly bound harness is formed. Thus, these terminals need to be later inserted into the connector of the other partly bound harness when the wiring harness is fully bound on the assembly board.

[0006] In the case that the terminals are later inserted into the connector, they need to be carefully inserted into specified terminal cavities. This results in more labor and time for the connection, a reduced productivity and a higher likeliness of an error insertion.

[0007] In view of the above problem, an object of the present invention is to simply and easily form a joint circuit by eliminating the later insertion of terminals into a connector.

[0008] This object is solved according to the invention by a joint device according to claim 1. Preferred embodiments of the invention are subject of the dependent claims.

[0009] According to the invention, there is provided a joint device for an automotive wiring harness, comprising: an insulation casing, a plurality of terminal connecting chambers defined in the insulation casing, and a bolt mounted in each terminal connecting chamber such that the shaft thereof projects into the corresponding terminal connecting chamber, wherein mount holes of terminals connected with ends of adjacent wires of those to form an automotive wiring harness are fitted or fittable down on the shafts of the bolts, which are then tightened by nuts to form a joint circuit.

[0010] According to a preferred embodiment of the invention, the plurality of terminal connecting chambers are defined in the insulation casing by providing one or more partition walls.

[0011] Preferably, the bolts have heads substantially embedded in the bottom walls of the respective terminal connecting chambers.

[0012] According to a further preferred embodiment, there is provided a joint device for an automotive wiring harness, comprising:

an insulation casing,
a plurality of terminal connecting chambers defined in the insulation casing by providing partition walls, and
a bolt having the head thereof embedded in the bottom wall of each terminal connecting chamber so that the shaft thereof projects,
wherein mount holes of terminals connected with ends of adjacent wires of those to form an automotive wiring harness are fitted down on the shafts of the bolts, which are then tightened by nuts to form a joint circuit.

[0013] As described above, a joint circuit is formed in a manner different from the prior art splice connection or connection by a joint connector. Specifically, terminals formed with mount holes (hereinafter, "LA terminals") are connected in advance with the ends of the wires and are connected with each other using bolts and nuts. By mounting the LA terminals one after another on the shafts of the bolts and tightening them by the nuts, the wires can be easily and surely connected as compared with a case where the terminals are inserted into a connector at a later stage.

[0014] Preferably, the joint device further comprises an earth plate of metal projecting from an outer surface of the insulation casing and formed with a bolt hole into which a bolt projecting from a vehicle body is insertable, wherein the earth plate is preferably secured to the bolt projecting from the vehicle body by a nut thereby being grounded.

[0015] Further preferably, the terminals connected with the ends of the wires of the wiring harness which form an earth circuit are mounted or mountable on the bolt projecting from the vehicle body by fitting the mount holes thereof down on the bolt and fastened by a nut,

thereby simultaneously connecting the wires of the wiring harness with the vehicle body to establish an earth and securing the insulation casing to the vehicle body.

[0016] In other words, the joint device may preferably further comprise an earth plate of metal projecting from an outer surface of the insulation casing and formed with a bolt hole into which a bolt projecting from a vehicle body is insertable, wherein the terminals connected with the ends of the wires of the wiring harness which form an earth circuit are mounted on the bolt projecting from the vehicle body by fitting the mount holes thereof down on the bolt and fastened by a nut, thereby simultaneously connecting the wiring harness with the vehicle body to establish an earth and securing the insulation casing to the vehicle body.

[0017] With this construction, the insulation casing can be used for the circuit connection of the wires and can, at the same time, be used to ground a plurality of wires. Further, the insulation casing can be secured to the vehicle body while the wires are grounded.

[0018] Alternatively or additionally, the joint device may further comprise an earth plate of metal projecting from an outer surface of the insulation casing and partly projecting into one terminal connecting chamber provided in the insulation casing, wherein the portions of the earth plate projecting into the terminal connecting chamber and projecting from the outer surface of the insulation casing are both formed with a mount hole; the shaft of the bolt projecting from the bottom wall extends or can extend through the mount hole of the earth plate in the one terminal connecting chamber; the mount hole provided terminals connected with the ends of the wires forming an earth circuit are fitted or fittable down on the shaft of the bolt and tightened or tightenable by the nut to be connected with the earth plate; and/or the mount hole of the portion of the earth plate projecting from the outer surface of the insulation casing is fitted or fittable down on the bolt projecting from the vehicle body and tightened or tightenable by the nut, thereby simultaneously connecting the wiring harness with the vehicle body to establish an earth and securing the insulation casing with the vehicle body.

[0019] With this construction, the wires to be grounded are fixedly connected with the bolt connected with the earth plate inside the insulation casing beforehand. Accordingly, the grounding and the securing of the insulation casing to the vehicle body can be performed only by fitting the mount hole of the earth plate projecting from the insulation casing to the shaft of the bolt projecting from the vehicle body and screwing the nut down on the shaft when the wiring harness is mounted in the vehicle body. Thus, it is not necessary at all to connect the terminals of the bolt shaft when the wiring harness is mounted on the vehicle body, making the assembling of the wiring harness on the vehicle body easier.

[0020] Preferably, wire guiding ribs are provided on the inner surfaces of one or more bottom walls of the

respective terminal connecting chambers of the insulation casing about the shafts of the bolts projecting from the bottom walls, so that wire connecting portions of the terminals to be placed one over another on the shafts of the bolts are passed one by one through clearances between the wire guiding ribs so as to be rotationally displaced with respect to each other or to avoid the mutual interference. Such a displacement of the terminal connecting portions of the plurality of wires to be mounted on one bolt shaft can prevent the thick terminal connection portions from being placed one over another.

[0021] The insulation casing is preferably integrally or separately provided with a cover for substantially closing an opening after the terminals are connected. In the case that the cover is integrally formed, it is connected via a thin hinge. Further, the cover is preferably lockable regardless of whether it is integrally or separately provided.

[0022] These and other objects, features and advantages of the present invention will become more apparent upon a reading of the following detailed description and accompanying drawings in which:

FIG. 1 is an exploded perspective view of a first embodiment,

FIG. 2 is a section of an essential portion of FIG. 1, FIG. 3 is a schematic diagram showing the connection of wires and a joint device,

FIG. 4 is a schematic perspective view of a first modification of the first embodiment,

FIG. 5 is a schematic perspective view of a second modification of the first embodiment,

FIG. 6 is a schematic perspective view of a second embodiment,

FIG. 7 is a schematic perspective view of a third embodiment,

FIG. 8 is a schematic view of a prior art, and

FIG. 9 is a schematic view of another prior art.

[0023] Hereafter, embodiments of the invention are described with the accompanying drawings.

[0024] FIGS. 1 to 3 show a first embodiment, in which, by a joint device 10, a connecting circuit is formed by joining a plurality of wires of a first branch portion 13 branched from a main portion 11 of a wiring harness W/H, another connecting circuit is formed by joining a plurality of wires of a second branch portion 14, and a plurality of wires of a third branch portion 15 are preferably grounded to a vehicle body.

[0025] The joint device 10 is comprised of a substantially box-shaped insulation casing 20 having an open upper surface and an open side surface, and three terminal connecting chambers 22, 23, 24 are defined by providing partition walls 21 in the insulation casing 20. In the two terminal connecting chambers 22, 23, heads 25a, 26a of bolts 25, 26 are substantially embedded in bottom walls 22a, 23a and shafts 25b, 26b thereof

extend into the terminal connecting chambers 22, 23, 24, preferably substantially upward.

[0026] In the remaining terminal connecting chamber 24, a side portion 27a of an earth plate 27 is inserted through a through hole formed in an outer wall 20a and substantially embedded in a bottom wall 24a. Further, a head 28a of a bolt 28 is substantially embedded in the bottom wall 24a while being held in contact with the earth plate 27, and a shaft 28b projects upward through the side portion 27b of the earth plate 27.

[0027] The other side of the earth plate 27 projects outward from the outer wall 20a, and this projecting portion 27b extends in the substantially same plane as the bottom wall of the insulation casing 20. The projecting portion 27b is formed with a bolt hole 27c.

[0028] As described above, the shafts 25b, 26b, 28b project from the centers of the bottom walls 22a, 23a, 24a of the respective terminal connecting chambers 22, 23, 24. A plurality of ribs 22b project from the bottom wall at specified intervals in such a manner as to substantially surround the shaft 25b, thereby defining a plurality of wire guiding portions 22c between the ribs 22b. Likewise, ribs 23b, 24b project about the bolts 26b, 26b, respectively to define a plurality of wire guiding portions 23c, 24c.

[0029] The insulation casing 20 is integrally or unitarily formed with a cover member 29 preferably having an L-shaped cross section via a thin hinge 30. The cover member 29 is adapted to substantially close the open upper and side surfaces. The cover member 29 is formed with openings 29a for permitting the wires to be withdrawn from the respective terminal connecting chambers. Further, locking portions 31 and engaging portions 32 for holding the cover member 29 and the insulation casing 20 locked are provided.

[0030] Terminals 35 are secured to ends of a plurality of wires w5 of the first branch portion 13, ends of a plurality of wires w6 of the second branch portion 14 and ends of a plurality of wires w7 of the third branch portion 15 which are connected or connectable by the joint device 10. Each terminal 35 is preferably a so-called LA terminal which is formed at its leading with a substantially circular electrical contact portion 35b having a mount hole 35a, and a barrel portion 35c thereof behind the contact portion 35b secured to the wire e.g. by clamping or cramping.

[0031] A circuit connection construction and an earth connection construction using the joint device 10 are described below.

[0032] The terminals 35 secured to a plurality of wires w5 of the first branch portion 13 of the wiring harness are inserted into the terminal connecting chamber 22 of the joint device 10 and the respective mount holes 35a are fitted down on the bolt 25b. These wires w5 pass one each through the wire guiding portions 22c, so that the barrel portions 35c are not placed one over another. In other words, the barrel portions 35c of each wire w5 is rotationally displaced or shifted by an angle different

from 0° or 360° about the axis of the shaft 25b at least with respect to the adjacent barrel portion(s) 35c. After all the mount holes are fitted down on the bolt 25b, a nut 36 is screwed down to connect the wires w5 of the first branch portion 13 with each other, thereby forming a joint circuit.

[0033] Similarly, the terminals 35 secured to a plurality of wires w6 of the second branch portion 14 of the wiring harness are inserted into the terminal connecting chamber 23 of the joint device 10 and the respective mount holes 35a are fitted down on the bolt 26b. These wires w6 pass one each through the corresponding wire guiding portions 23c, so that the barrel portions 35c are not placed one over another. After all the mount holes are fitted down on the bolt 26b, a nut 37 is screwed down to connect the wires w6 of the second branch portion 14 with each other, thereby forming a joint circuit.

[0034] The terminals 35 secured to a plurality of wires w7 of the third branch portion 15 of the wiring harness are inserted into the terminal connecting chamber 24 of the joint device 10 and the respective mount holes 35a are fitted down on the bolt 28b. These wires w7 pass one each through the corresponding wire guiding portion 24c, so that the barrel portions 35c are not placed one over another but rotationally displaced with respect to each other. After all the mount holes are fitted down on the bolt 28b, a nut 38 is screwed down to connect the wires w7 of the third branch portion 15 with each other. Since the bolt 28 is in contact with the earth plate 27, the wires w7 are already brought into contact with the earth plate 27.

[0035] After the terminals 35 are inserted into the respective terminal connecting chambers and fastened by the bolts and nuts as described above, the cover member 29 is closed to be locked with the insulation casing 20.

[0036] All the terminals 35 connected with the ends of the wires are fixed by the bolts and nuts when the wiring harness is assembled.

[0037] When the wiring harness is to be installed in a vehicle body, the wires w7 of the third branch portion 15 are preferably grounded to a vehicle body 40 and, at the same time, the joint device 10 is secured to the vehicle body 40 by fitting the bolt hole 27c of the projecting portion 27b of the earth plate 27 projecting from the outer surface of the insulation casing 20 down on a bolt 41 projecting from the vehicle body 40 and screwing a nut 44 down on the bolt 41.

[0038] FIGS. 4 and 5 show modifications of the first embodiment, wherein same or similar elements are denoted with same or similar reference numerals. In a first modification shown in FIG. 4, the insulation casing 20 is comprised of a bottom wall and partition walls, and the cover member 29 is a substantially box-shaped separate member. In a second modification shown in FIG. 5, the insulation casing 20 is substantially box-shaped and has an open upper surface and the cover member 29 has a substantially planar shape. As can be seen

from these, the insulation casing 20 and the cover member 29 can be suitably shaped provided that the connection of the terminals and the tightening of the bolts and nuts are easy.

[0039] FIG. 6 shows a second embodiment, which differs from the first embodiment in that the terminals 35 connected with the wires w7 of the third branch portion 15 are grounded by being directly fitted down on the bolt 41 projecting from the vehicle body 40. Thus, the terminal connecting chamber 24 connected with the earth plate 27 and the bolt 28 can be eliminated. No further description is given since the other construction and action are same.

[0040] FIG. 7 shows a third embodiment, which differs from the first embodiment in that only joint circuits are formed without grounding. In other words, only the terminal connecting chambers 22, 23 of the first embodiment are provided and the terminal connecting chamber 24 and the earth plate 27 are not provided.

[0041] If the construction of the third embodiment is adopted, grounding cannot simultaneously be performed. However, such a construction can be used instead of the prior art joint connector and splice connection.

[0042] As is clear from the above description, it is sufficient to insert the terminals at the ends of the wires into the terminal connecting chambers of the joint device and to fasten them by the bolts and nuts in order to form a joint circuit. Accordingly, operability can be improved. Further, an error insertion of the terminals into the connector can be avoided by eliminating the later insertion of the terminals into the connector on the wiring harness assembly board which has been a problem with the prior art.

[0043] Further, a single joint device can simultaneously perform the circuit connection and the grounding. Further, by the grounding, the joint device can simultaneously be secured to the vehicle body. Further, an operation of mounting the terminals on the bolt projecting from the vehicle body during the mounting of the wiring harness on the vehicle body can be eliminated.

[0044] Furthermore, since the joint circuit is formed by fitting the mount holes of the terminals down on the bolts and tightening them by the nuts, a desired number of wires can be connected to form a joint circuit without limiting the number of the terminals. This makes it easier to respond to a change in the circuit.

LIST OF REFERENCE NUMERALS

[0045]

10	Joint Device
11	Wiring Harness Main Portion
13	First Branch Portion
14	Second Branch Portion
15	Third Branch Portion
20	Insulation Casing

21	Partition Wall
22, 23, 24	Terminal Connecting Chamber
27	Earth Plate
25, 26, 28	Bolt
22b, 23b, 24b	Wire Guiding Rib
29	Cover Member
35	Terminal
35a	Mount Hole
36, 37, 38	Nut
40	Vehicle Body
41	Bolt
44	Nut

Claims

1. A joint device (10) for an automotive wiring harness (W/H), comprising:
 - an insulation casing (20),
 - a plurality of terminal connecting chambers (22; 23; 24) defined in the insulation casing (20), and
 - a bolt (25; 26; 28) mounted in each terminal connecting chamber (22; 23; 24) such that a shaft (25b; 26b; 28b) thereof projects into the corresponding terminal connecting chamber (22; 23; 24),
 - wherein mount holes (35a) of terminals (35) connected with ends of adjacent wires (w5; w6; w7) of those to form an automotive wiring harness (W/H) are fitted or fittable down on the shafts (25b; 26b; 28b) of the bolts (25; 26; 28), which are then tightened by nuts (36; 37; 38) to form a joint circuit.
2. A joint device according to claim 1, further comprising an earth plate (27) of metal projecting from an outer surface of the insulation casing (20) and formed with a bolt hole (27c) into which a bolt (41) projecting from a vehicle body (40) is insertable, wherein the earth plate (27) is preferably secured to the bolt (41) projecting from the vehicle body (40) by a nut (44) thereby being grounded.
3. A joint device according to claim 2, wherein the terminals (35) connected with the ends of the wires (w7) of the wiring harness (W/H) which form an earth circuit are mounted or mountable on the bolt (41) projecting from the vehicle body (40) by fitting (FIG. 6) the mount holes (35a) thereof down on the bolt (41) and fastened by the nut (44), thereby simultaneously connecting the wires (w7) or the wiring harness (W/H) with the vehicle body (40) to establish an earth and securing the insulation casing (20) to the vehicle body (40).
4. A joint device according to claim 2 or 3, wherein the earth plate (27) is partly projecting into one terminal

connecting chamber (24) provided in the insulation casing (20), wherein the portions of the earth plate (27) projecting into the terminal connecting chamber (24) and projecting from the outer surface of the insulation casing (20) are both formed with a mount hole (27c); the shaft (28b) of the bolt (28) projecting from the bottom wall (24a) extends or can extend through the mount hole of the earth plate (27) in the one terminal connecting chamber (24); wherein the mount hole (35a) provided terminals (35) connected with the ends of the wires (w7) forming an earth circuit are fitted or fittable down on the shaft (28b) of the bolt (28) and tightened or tightenable by the nut (44) to be connected with the earth plate; and/or wherein the mount hole (27c) of the portion of the earth plate (27) projecting from the outer surface of the insulation casing (20) is fitted or fittable down on the bolt (41) projecting from the vehicle body (40) and tightened or tightenable by the nut (44), thereby simultaneously connecting the wire (w7) of the wiring harness (W/H) with the vehicle body (40) to establish an earth and securing the insulation casing (20) with the vehicle body (40).

5. A joint device according to one or more of the preceding claims, further comprising wire guiding ribs (22b-24b) provided on the inner surfaces of one or more bottom walls (22a-24a) of the respective terminal connecting chambers (22; 23; 24) of the insulation casing (20) about the shafts (25b; 26b; 28b) of the bolts (25; 26; 28) projecting from the bottom walls (22a-24a), so that wire connecting portions (35c) of the terminals (35) to be placed one over another on the shafts (25b; 26b; 28b) of the bolts (25; 26; 28) are passed one by one through clearances (22c-24c) between the wire guiding ribs (22b-24b) so as to be rotationally displaced with respect to each other.
6. A joint device according to one or more of the preceding claims, wherein the insulation casing (20) is integrally or separately provided with a cover (29) for substantially closing an opening after the terminals (35) are connected.
7. A joint device according to one or more of the preceding claims, wherein the plurality of terminal connecting chambers (22; 23; 24) are defined in the insulation casing (20) by providing one or more partition walls (21).
8. A joint device according to one or more of the preceding claims, wherein the bolts (25; 26; 28) have heads (25a; 26a; 28a) substantially embedded in the bottom walls (22a; 23a; 24a) of the respective terminal connecting chambers (22; 23; 24).

FIG. 2

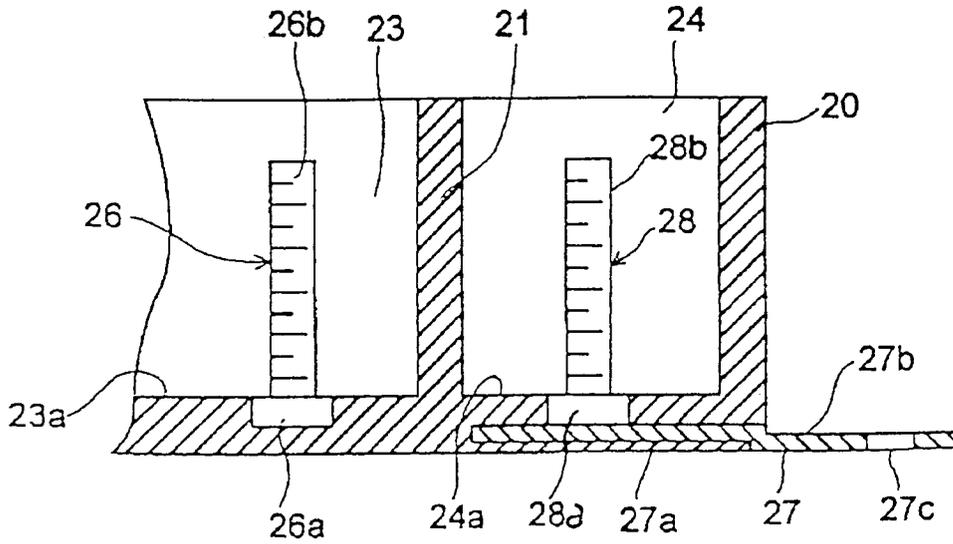


FIG. 3

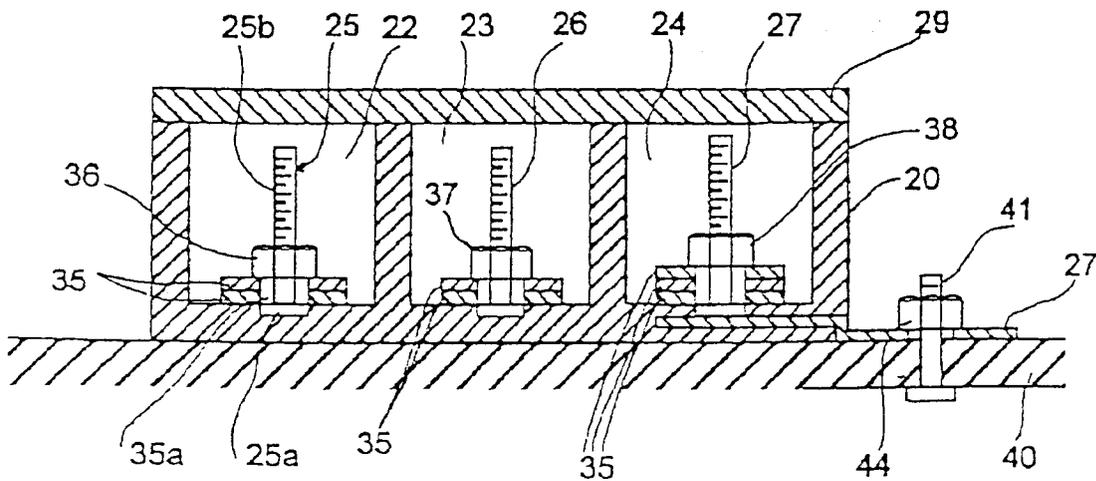


FIG. 4

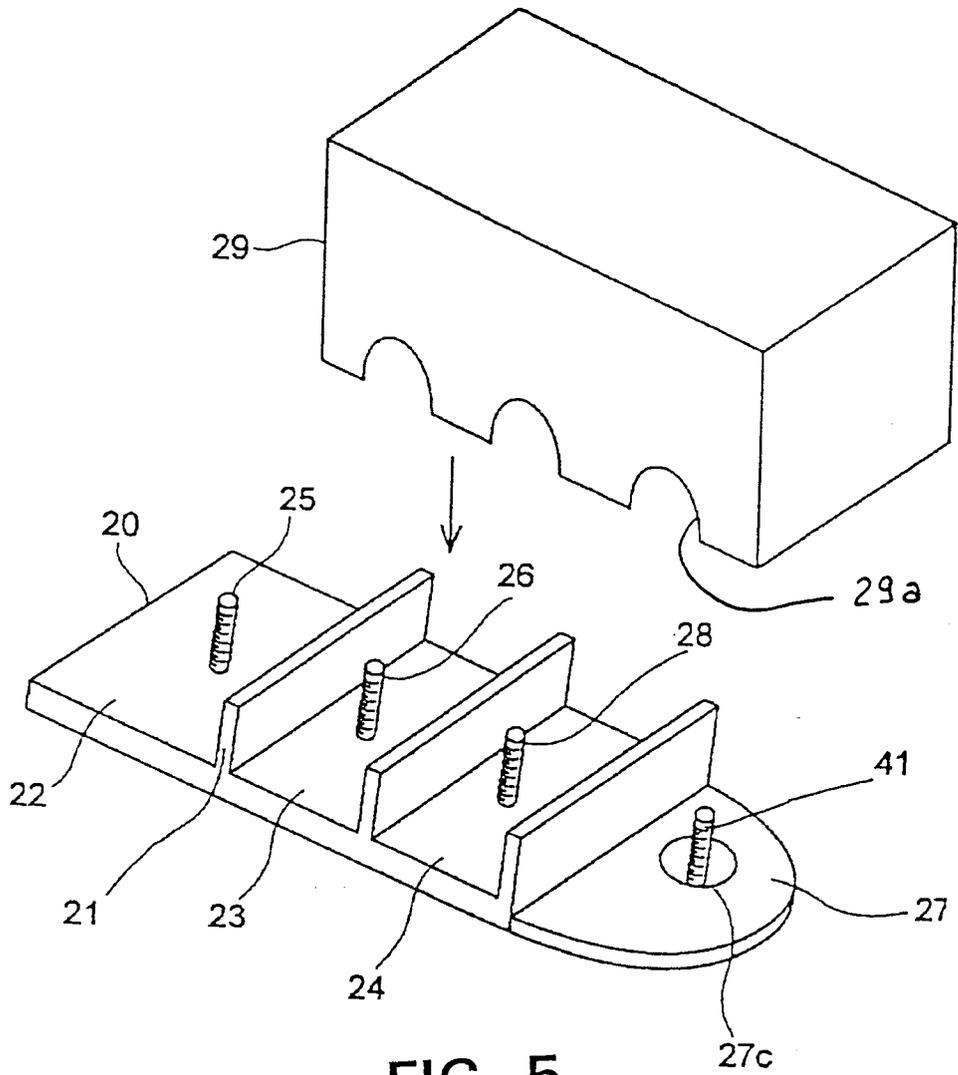


FIG. 5

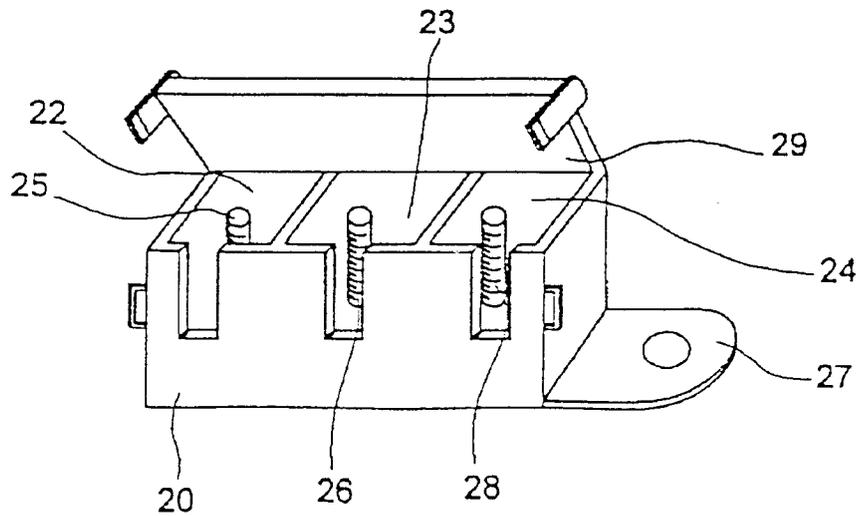


FIG. 6

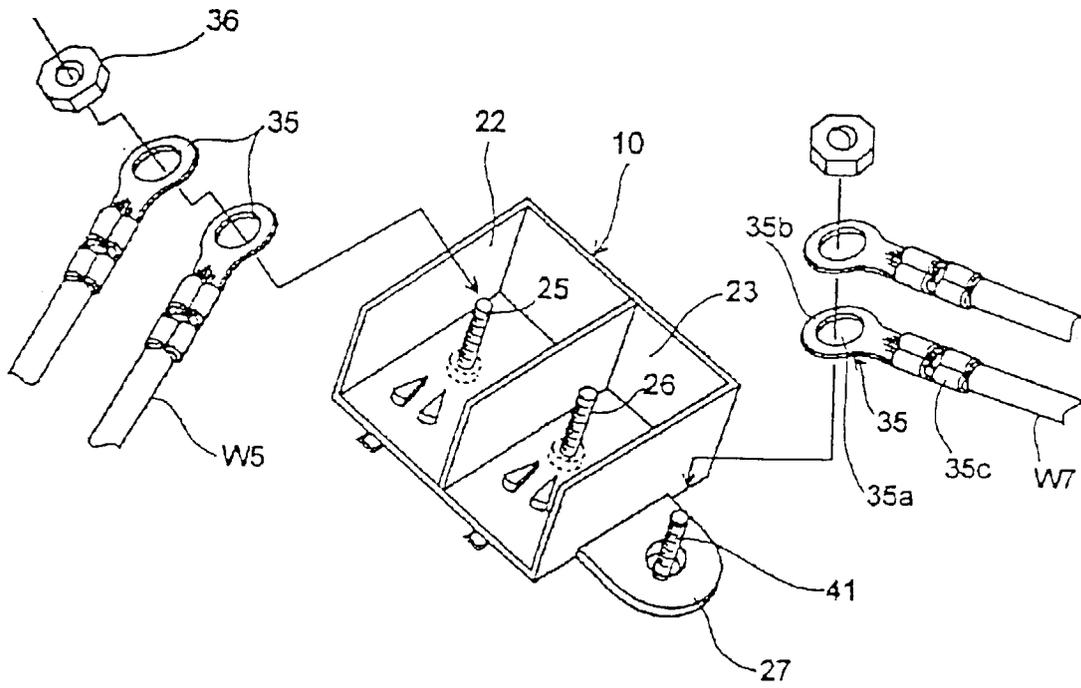


FIG. 7

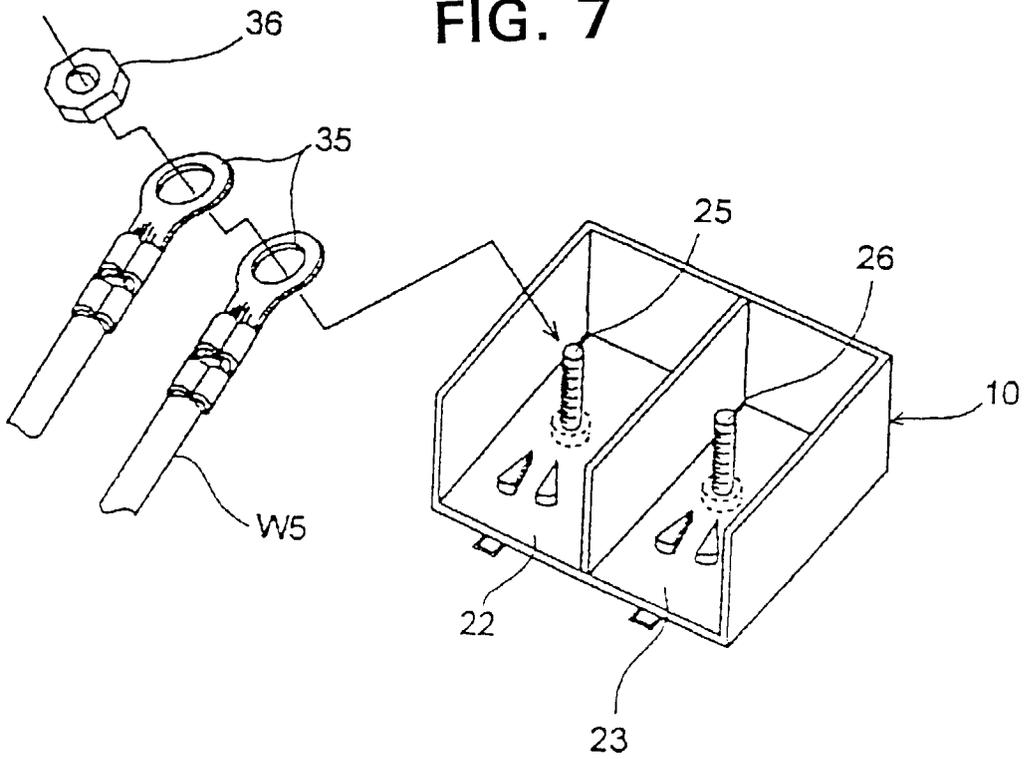


FIG. 8
PRIOR ART

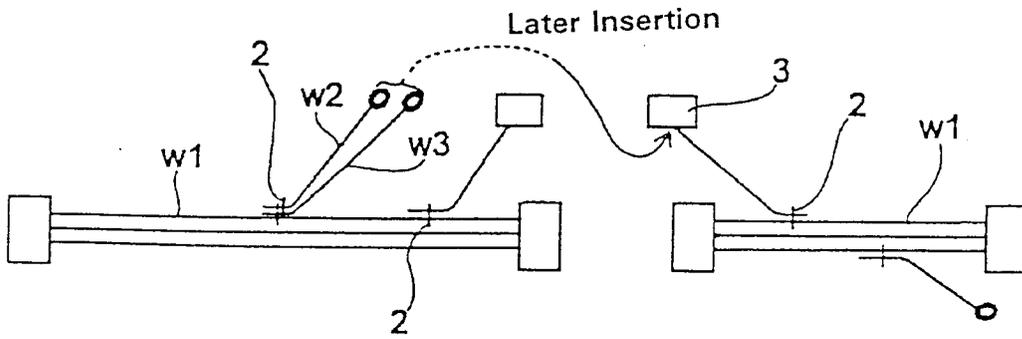
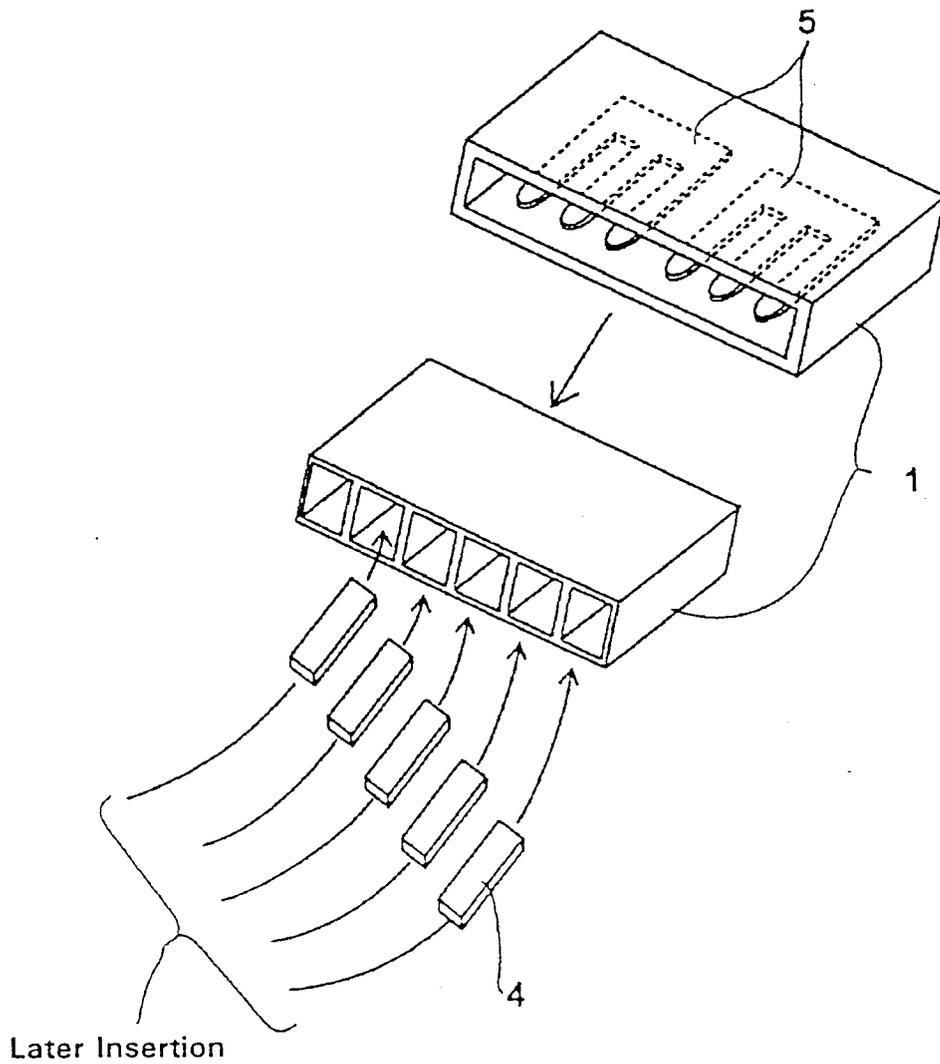


FIG. 9
PRIOR ART





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 98 11 4343

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	DE 195 27 751 A (MITSUBISHI ELECTRIC CORP) 1 February 1996 * column 5, line 31 - column 6, line 17; figures 1-4 *	1,6,7	H01R4/30 H01R11/09 H01R11/12
A	--- DATABASE WPI Week 9605 Derwent Publications Ltd., London, GB; AN 96-047455 XP002082588 OKUMURA HITOSHI: "Earthing junction terminal fitting for motor vehicle wiring harness" & JP 07 312248 A (SUMITOMO DENSO KK) , 28 November 1995 * abstract *	1-4	
A	--- EP 0 075 455 A (FUJITSU LTD) 30 March 1983 * page 4, line 1 - page 5, line 20; figures 3,4 *	1-3	
A	--- DE 40 16 521 A (ELDIS EHMKI & SCHMID OHG) 28 November 1991 * column 6, line 47 - line 64; figure 6 *	5	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			H01R
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		29 October 1998	Criqui, J-J
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	

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